

Error analysis of classifier use in the written Chinese of deaf students

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Abstract. This study investigated classifier use in the written Chinese of 20 prelingually deaf students from Grade 6 of primary school to Grade 12 at Qinhuangdao Special School. A total of 66 written compositions comprising 18,633 Chinese characters were collected and analyzed. Six categories of classifier errors were identified: omission, addition, incorrect substitute, incorrect word order, incomplete classifier phrase, and overgeneralization of the general classifier *ge* (个) and indefinite classifiers. The findings indicate an overall error rate of 26.33%, with omission, overgeneralization of the general classifier *ge* (个) and indefinite classifiers, and incorrect substitute constituting the three most frequent error types. As students progressed through higher grade levels, errors such as incorrect substitute and overgeneralization gradually decreased, whereas omission became increasingly fossilized. The causes of these errors include negative transfer from sign language as the learners' first language, the complexity of the Chinese classifier system, insufficient linguistic input available to students with hearing impairments, cognitive economy strategy, and limitations in classroom instruction. By comparing the error patterns of junior and senior secondary students and incorporating AI-assisted multimodal teaching tools, this study proposes targeted instructional strategies involving lesson preparation, classroom instruction, and differentiated post-class training to address the weaknesses of deaf students in acquiring Chinese classifiers.

Keywords: deaf students, written Chinese, classifiers, error analysis

1. Introduction

"If sign language serves as the spiritual home for some deaf people, then Chinese is the foundation upon which all deaf people establish themselves in society". In *Research on the Written Chinese of Deaf People: A Corpus-Based Study*, Huihua Lü et al. emphasize that learning Chinese is of fundamental importance for all deaf individuals [1]. As a second language for many deaf learners, Chinese not only enables them to acquire knowledge and understand society but also serves as an indispensable medium for communication with hearing people. Its significance is therefore self-evident. A substantial body of research in China has examined Chinese as a second language for deaf learners, with most studies focusing on the acquisition of written Chinese and the analysis of learner errors. The majority of scholars have summarized the common problems in deaf students' written Chinese and proposed corresponding pedagogical recommendations, particularly

regarding grammatical and lexical errors. Some researchers have zoomed in on specific word classes and sentence patterns. For example, Ke Chen et al. analyzed the diaries of 34 deaf students from Grades 4 to 9 to investigate errors in the use of directional verbs and compared their findings with the use of directional verbs by native Chinese speakers [2]. Based on language transfer theory, Qing Liu et al. conducted an in-depth analysis of errors in deaf students' use of the Chinese *shi* (是) sentence construction and explored the underlying causes [3]. In addition, many studies have concentrated on the influence of sign language on the acquisition of written Chinese by deaf learners, with the aim of identifying effective teaching approaches. Although research on the written Chinese of deaf learners has increased in recent years, studies devoted to specific lexical categories remain insufficient and warrant further investigation.

As a functional word class in Modern Chinese, classifiers are often regarded as less important than major lexical categories such as nouns and verbs. Nevertheless, they play an irreplaceable role in both spoken and written Chinese. In *General Studies of Modern Chinese (3rd ed.)*, Jingmin Shao classifies Chinese classifiers into nominal classifiers and verbal classifiers [4]. Nominal classifiers denote units of measurement for people and objects and include individual classifiers (e.g., *ge*, *ming*, *zhi*, *liang*), measurement classifiers (e.g., *yuan*, *second*, *ton*), and borrowed nominal classifiers (e.g., *yi xiangzi yifu* "a box of clothes"). Verbal classifiers indicate the frequency of actions, such as *ci*, *hui*, and *xia*. Borrowed verbal classifiers include five subcategories: temporal classifiers (e.g., *year*, *month*, *day*), body-part classifiers (e.g., *kan yi yan* "take one glance", *ti yi jiao* "give one kick", *da liang quan* "throw two punches"), instrument classifiers (e.g., *kan yi dao* "make one cut", *fang yi qiang* "fire one shot", *xi yi shui* "give one rinse"), accompanying classifiers (e.g., *chang yi qu* "sing a song", *zou yi bu* "take one step", *han yi sheng* "give one shout"), and reduplicated classifiers (e.g., *kan yi kan*, *zou yi zou*, *qiao yi qiao*) [4]. Classifiers combine with other constituents to form classifier phrases, which are generally divided into three types: numeral-classifier phrases (e.g., *yi ge*, *san wei*, *wu hui*), demonstrative-classifier phrases (e.g., *zhe ge*, *na dong*, *mei tian*), and interrogative-classifier phrases (e.g., *na ci*, *ji ming*, *duo shao liang*). These three types can also combine with one another to form more complex structures. For example, the numeral-classifier phrase *yi ge* and the demonstrative-classifier phrase *zhe ge* combine to form *zhe yi ge* ("this one"), while the numeral-classifier phrase *san ci* and the interrogative-classifier phrase *na ci* combine to form *na san ci* ("which three times") [4]. Beyond their quantitative function, Chinese classifiers can also convey subjective meanings such as approval, disapproval, intimacy, or contempt, reflecting their additional rhetorical and expressive functions.

Current research on classifier acquisition in Chinese as a Second Language (CSL) primarily focuses on three areas: factors influencing classifier acquisition, interlanguage error analysis, and the development of optimized classroom teaching strategies. This framework was systematically summarized by Qiuyi Huang through a comprehensive review of both domestic and international literature [5]. Existing studies in China have consistently adopted interlanguage error analysis as the dominant research approach. Numerous empirical investigations have examined classifier errors and explored their underlying causes. For instance, Zhu Lin and Xiaobing Zhou investigated the acquisition of Chinese collective classifiers using data from international students' language tests and HSK composition corpora. They identified three major error types—misrepresentation (Authors use incorrect substitute in this article), omission, and addition—and explained these errors from four perspectives: negative transfer from the learners' first language, overgeneralization of target-language rules, universal cognitive mechanisms, and misleading textbook instruction. Based on learners' accuracy rates, they further classified the difficulty levels and acquisition stages of collective classifiers, and innovatively proposed a criterion based on separability to distinguish the classifiers *shuang*, *dui*, and *fu*. Their findings provide empirical support for classifier instruction and textbook development in international Chinese language education [6]. With regard to participant selection, research on classifier

acquisition in Chinese as a second language has shown a clear preference for international students studying in China, with most empirical data and research findings derived from this population. In contrast, relatively little attention has been paid to classifier acquisition and classifier errors among deaf learners, for whom Chinese also functions as a second language. This gap in the literature provides the motivation and research space for this study.

2. Research methodology

The participants in this study were 20 deaf students enrolled at the Qinhuangdao Special School, ranging from Grade 6 of primary school to Grade 12. Among them, 10 students from Grade 6 to Grade 9 were assigned to the junior secondary group, while the remaining 10 students from Grades 10 to 12 constituted the senior secondary group. All participants were prelingually deaf and relied primarily on sign language, supplemented by spoken Chinese, in their daily communication.

A total of 66 writing samples, including diaries and compositions, were collected, comprising 18,633 Chinese characters. Of these, the junior secondary group contributed 49 writing samples totaling 9,663 characters, while the senior secondary group contributed 17 writing samples totaling 8,970 characters.

A closed written corpus was manually constructed for the two groups of deaf students, namely the junior secondary group (Grades 6–9) and the senior secondary group (Grades 10–12). The researchers examined each diary and composition individually and manually annotated every classifier occurrence. Nominal classifiers and verbal classifiers were distinguished, and complex classifier phrases, such as demonstrative-classifier plus numeral-classifier combinations and interrogative-classifier plus numeral-classifier combinations, were also identified. Using *A Dictionary of Modern Chinese Classifier Usage* as the evaluation criterion, the researchers manually determined whether each classifier was used correctly [7]. Building upon the four categories of grammatical errors in second-language learning proposed by Jianji Lu, the present study expanded the classification of classifier errors in Chinese as a second language to six categories [8]. The six categories of errors are as follows: omission, addition, incorrect substitute, incorrect word order, incomplete classifier phrase, and overgeneralization of the general classifier *ge* (个) and indefinite classifiers. Omission refers specifically to cases in which only the classifier is omitted, as in *liang yu* ("two fish"), where the classifier *tiao* is missing. Addition refers to the redundant insertion of an additional classifier or the repetition of an existing classifier when a classifier is already present, as well as the addition of unnecessary modifiers to an existing classifier phrase. Incorrect substitute errors occur when learners replace the target correct classifier with an inappropriate one that fails to match in meaning and collocation. Incorrect word order includes misordering within numeral-classifier phrases involving either nominal or verbal classifiers. Incomplete classifier phrase refers to cases in which constituents other than the classifier itself are missing from the classifier phrase. Although overgeneralization of *ge* (个) and indefinite classifiers is not, strictly speaking, a classifier error, it is treated as a separate type in this study because it represents an inappropriate pattern of classifier use that warrants independent analysis.

3. Types and causes of classifier errors

Through the manual identification and analysis of the written corpora produced by the junior and senior secondary groups, the researchers extracted a total of 471 valid classifier instances, of which 124 were identified as erroneous, yielding an overall error rate of 26.33%. The junior secondary group produced 257 valid instances with 71 error instances, resulting in an error rate of 27.63%, whereas the senior secondary group produced 214 valid instances with 53 error instances, corresponding to an error rate of 24.77%.

Across the entire corpus, the six types of classifier errors (Table 1) were distributed as follows: 54 cases of omission (43.55% of all errors), 8 cases of addition (6.45%), 16 cases of incorrect substitute (12.90%), 7 cases of incorrect word order (5.65%), 12 cases of incomplete classifier phrase (9.68%), and 27 cases involving overgeneralization of the general classifier *ge* (个) and indefinite classifiers (21.77%).

Table 1. Distribution of the six types of Chinese classifier errors

Error Type	Number of Errors	Percentage of Total Errors
Omission	54	43.55%
Addition	8	6.45%
Incorrect substitute	16	12.90%
Incorrect word order	7	5.65%
Incomplete classifier phrase	12	9.68%
Overgeneralization of the general classifier <i>ge</i> (个) and indefinite classifiers	27	21.77%
Total	124	100.00%

3.1. Analysis of classifier errors in the junior secondary group

3.1.1. Omission

Omission occurred 27 times, accounting for 50.94% of all errors in the junior secondary group, making it the most frequent error type (Table 2). All instances involved the omission of nominal classifiers. Examples include:

Example 1: 有人家生孩子了.

Example 2: 弟弟给我买了很大的吃的.

Example 3: 信仰是指我们班前进的光明.

In Example 1, the household classifier *hu* (户) is omitted. The sentence should read: "有(一)户人家生孩子了" ("A family has had a baby"). In Example 2, the classifier *dui* (堆, "pile") is missing and should be revised as "弟弟给我买了一大堆吃的" ("My younger brother bought me a large pile of snacks"). In Example 3, the classifier *shu* (束, "beam") is omitted; the sentence should be revised as "信仰是指引我们班前进的一束光" ("Faith is a beam of light guiding our class forward"). All three examples involve the omission of an obligatory nominal classifier preceding the noun, thereby violating the Chinese syntactic pattern of numeral + classifier + noun.

3.1.2. Addition

A total of five instances of addition were identified, accounting for 5.66% of the junior secondary group's errors (Table 2). These errors mainly involved the repetition or doubling of classifiers, as well as the insertion of unnecessary particles following classifier phrases. Examples include:

Example 1: 还有一条条的围巾.

Example 2: 他的身体的1米64米.

Example 3: 几十辆的宝马车.

In Example 1, the context indicates that each snowman wears only one scarf. Therefore, "一条条" ("one scarf after another") should be simplified to "一条", and the particle "的" should be deleted. The corrected sentence is "还有一条围巾" ("There is also one scarf"). In Example 2, the length classifier *mi* (米, "meter") is unnecessarily repeated and should be corrected to "他的身高是一米六四" ("He is 1.64 meters tall"). Since this study focuses exclusively on classifier-related errors, other lexical or grammatical problems in the original

sentence are not discussed. In Example 3, the particle 的 is redundant and should be omitted. Therefore, the correct expression should be "几十辆宝马车" ("dozens of BMW cars").

3.1.3. Incorrect substitute

Incorrect substitute occurred 11 times, accounting for 15.49% of the junior secondary group's errors (Table 2). These cases involve the replacement of the appropriate classifier with an incompatible one. Examples include:

Example 1: 拥有一套独特的跑步姿势.

Example 2: 虽然我们是同一个同桌.

Example 3: 被一只耀眼的金光穿过.

In Example 1, the classifier *tao* (套, "set") typically refers to complete sets of objects or procedures. The appropriate classifier for a running posture is *zhong* (种, "kind"), so the sentence should read "(她)拥有一种独特的跑步姿势" ("She has a unique kind of running posture"). In Example 2, "同桌" ("deskmates") denotes a paired relationship and therefore should take the classifier *dui* (对, "pair"), yielding "虽然我们是一对同桌" ("Although we are a pair of deskmates"). In Example 3, "金光" ("golden light") should be quantified by classifiers such as *lu* (缕, "strand") or *dao* (道, "beam"). The sentence should therefore be revised as "被一道耀眼的金光穿过" ("pierced by a dazzling beam of golden light").

3.1.4. Incorrect word order

Only three cases of incorrect word order were identified, representing 4.23% of the junior secondary group's errors and making it the least frequent error type (Table 2). All cases involved misordering within the nominal classifier construction numeral + classifier + noun. Examples include:

Example 1: 我身上钱一点都没有.

Example 2: 他给我一种感觉的亲生的好哥哥.

In Example 1, the indefinite quantifier 一点儿 ("a bit of") should precede the noun 钱 ("money"), producing the correct sentence: "我身上一点儿钱都没有" ("I don't have a bit of money on me"). In Example 2, the modifying phrase "亲生的好哥哥(般的)" ("like a real elder brother") should be placed between the classifier *zhong* (种, "kind") and the noun "感觉" ("feeling"), resulting in "他给我一种亲生的好哥哥般的感觉" ("He gives me a kind of feeling like an elder brother by blood").

3.1.5. Incomplete classifier phrase

There were eight instances of incomplete classifier phrase, accounting for 11.27% of the junior secondary group's errors (Table 2). Most involved the omission of the noun within the nominal classifier phrase "numeral + classifier + noun". Examples include:

Example 1: 给他取个小书虫.

Example 2: 就好像一颗没有阳光.

In Example 1, the noun "外号" ("nickname") is missing. The sentence should be revised as "给他取个'小书虫'的外号" ("Give him a nickname 'Bookworm'"). In Example 2, the noun "种子" ("seed") is omitted. The corrected sentence is "就好像一颗没有阳光的种子" ("Just like a seed without sunlight").

3.1.6. Overgeneralization of the general classifier *ge* (个) and indefinite classifiers

Overgeneralization of the general classifier *ge* (个) and indefinite classifiers occurred 17 times, accounting for 23.94% of the junior secondary group's errors (Table 2). All cases involved overgeneralization of the general classifier *ge* (个). Examples include:

Example 1: 也会去一个学校的大树旁边学唱歌.

Example 2: 人们夸列车超人你是个大英雄呀.

In Example 1, the noun "学校" ("school") conventionally takes the classifier *suo* (所). The sentence should therefore be revised as "(他们)也会去一所学校的大树旁边学唱歌" ("They would also go to the big tree

beside a school to learn singing"). In Example 2, the honorific classifier *wei* (位) is conventionally used when referring respectfully to a person, particularly a hero. The general classifier *ge* is therefore inappropriate. The corrected sentence is "人们夸列车超人你是位大英雄呀" ("People praised Train Superman, saying that you are a great hero").

3.2. Analysis of classifier errors in the senior secondary group

3.2.1. Omission

Omission occurred 27 times, accounting for 50.94% of all errors in the senior secondary group, making it the most frequent error type (Table 2). Similar to the junior secondary group, all cases involved the omission of nominal classifiers. Examples include:

Example 1: 队长一严格的样子说.

Example 2: 有的土豆丝与辣椒丝馅, 有的萝卜与土豆丝馅, 有的韭菜炒蛋馅, 还有的大葱肉馅, 好多馅.

In Example 1, the classifier *fu* (副), which collocates with facial expressions or appearances, is omitted after the numeral "一" ("a/one"). The sentence should be revised as "队长一副严格的样子说" ("The captain spoke with a stern expression"). In Example 2, the phrase "好多馅" ("many fillings") lacks the classifier *zhong* (种, "kind"). The correct form is "好多种馅" ("many kinds of fillings").

3.2.2. Addition

There were three instances of addition, accounting for 5.66% of the senior secondary group's errors, making it the least frequent error type (Table 2). In addition to the repetition of the same classifier and the addition of unnecessary modifiers, some cases involved inserting an extra classifier alongside an already appropriate one. Examples include:

Example 1: 但有一个家人站了出来.

Example 2: 这一刻儿.

In Example 1, the context indicates that an entire family on an airplane stood up to offer their seats to an injured boy, his brother, and their mother. Therefore, the classifier 个 is redundant because "一家人" ("one family") already contains the appropriate classifier. The sentence should be corrected as "但有一家人站了出来" ("But one family stepped forward"). In Example 2, the expression "这一刻儿" is common in certain spoken dialects, but in standard written Chinese the suffix "儿" is unnecessary. The correct form is "这一刻" ("this moment").

3.2.3. Incorrect substitute

Incorrect substitute occurred five times, accounting for 9.43% of the senior secondary group's errors (Table 2). Similar to the junior secondary group, these errors involved replacing the appropriate classifier with an incompatible one. Examples include:

Example 1: 青春啊, 你就是一团火把.

Example 2: 难忘的八个字是哪一个?

In Example 1, the classifier *tuan* (团) is typically used with flames, clouds, or masses of similar substances, whereas the conventional classifiers for "火把" ("torch") are *zhi* (支) or *shu* (束). The sentence should therefore be revised as "青春啊, 你就是一束火把" ("Youth, you are a blazing torch"). In Example 2, "八个字" ("eight characters") forms a complete sentence rather than an isolated word string. Consequently, the sentence-level classifier *ju* (句) should be used, and the correct sentence should be "难忘的八个字是哪一句?" ("Which is the unforgettable eight-character sentence?").

3.2.4. Incorrect word order

There were four instances of incorrect word order, accounting for 7.55% of the senior secondary group's errors (Table 2). Two involved nominal classifier phrases of the form "numeral + classifier + noun", while the other two involved verbal classifier phrases of the form "verb + numeral + classifier". Examples include:

Example 1: 我倒水一点儿.

Example 2: 我妈对我摸头说: "没事, 看着他们聊天"一声.

In Example 1, the nominal classifier phrase "一点儿水" ("a little water") is incorrectly ordered as "水一点儿" ("water a little"). The sentence should be revised as "我倒一点儿水" ("I poured a little water"). In Example 2, the verbal classifier phrase should follow the pattern "verb + numeral + classifier", resulting in "说了一声" ("said in a soft voice" or literally "uttered one sentence"). The corrected sentence is: "妈妈摸了摸我的头, 说了一声: '没事, 看着他们聊天'" ("My mother patted my head and said, 'It's okay. Just watch them chatting'").

3.2.5. Incomplete classifier phrase

A total of four instances of incomplete classifier phrase were identified, accounting for 7.55% of the senior secondary group's errors (Table 2). Most involved the omission of the verb in verbal classifier phrases "verb + numeral + classifier" or the omission of the demonstrative pronoun in demonstrative-classifier phrases. Examples include:

Example 1: "开始"大一声.

Example 2: 一刻我明白了.

In Example 1, the verb "喊" ("shout") is incorrectly omitted, and the word order is also wrong. The sentence should be revised as "(裁判)大喊一声'开始!'" ("The referee shouted, 'Start!'"). In Example 2, the demonstrative-classifier phrase should be "那一刻" ("at that moment"). The demonstrative pronoun "那" ("that") in the original sentence is missing, and the sentence should therefore be corrected as "那一刻我明白了" ("At that moment, I understood").

3.2.6. Overgeneralization of the general classifier *ge* (个) and indefinite classifiers

Overgeneralization of the general classifier *ge* (个) and indefinite classifiers occurred 10 times, accounting for 18.87% of the senior secondary group's errors (Table 2). In addition to overgeneralization of the general classifier *ge* (个), some cases involved the inappropriate use of indefinite classifiers such as "些" ("some"). Examples include:

Example 1: 就好似一个鸟在海洋上飞累了.

Example 2: 听到一些恶狗一直喊, 看到一些树.

In Example 1, birds conventionally take the classifier *zhi* (只). The sentence should therefore be revised as "就好似一只鸟在海洋上飞累了" ("It was just like a bird that had grown tired while flying over the sea"). In Example 2, the indefinite classifier "些" ("some") is generally used for indefinite group referents. Because dogs and trees refer to countable individual objects, individual classifiers such as "几只" ("several dogs") and "几棵" ("several trees") are more appropriate. The corrected sentence is "听到几只恶狗一直叫, 看到几棵树" ("I heard several vicious dogs barking continuously and saw several trees").

Table 2. Frequency and proportion of the six types of Chinese classifier errors in the junior and senior secondary groups

Error Type	Junior Secondary Group (Frequency/Percentage)	Senior Secondary Group (Frequency/Percentage)
Omission	27/38.03%	27/50.94%
Addition	5/7.04%	3/5.66%
Incorrect substitute	11/15.49%	5/9.43%
Incorrect word order	3/4.23%	4/7.55%
Incomplete classifier phrase	8/11.27%	4/7.55%
Overgeneralization of the general classifier <i>ge</i> (个) and indefinite classifiers	17/23.94%	10/18.87%
Total	71/100%	53/100%

3.3. Analysis of the causes of classifier errors

3.3.1. Negative transfer from sign language as the first language

As the first language of deaf students, sign language does not contain the same signed "classifiers" as those in Chinese. Instead, it relies on classifier handshapes and body movements to distinguish categories of objects, while quantities are typically expressed through a simple "numeral + noun" structure. Consequently, classifier omission in written Chinese can be attributed to the absence of classifiers in Chinese Sign Language [9]. According to Longmei Ye, numerals in sign language frequently function simultaneously as classifiers. Because deaf students habitually encode meaning through the visual-spatial system of sign language, they tend to transfer this omission pattern into written Chinese, resulting in the frequent omission of classifiers. Furthermore, classifier handshapes in sign language are relatively broad and generalized, lacking distinctions among specific Chinese classifiers such as *tiao* (条), *zhang* (张), and *zhi* (只). A single general handshape is often used to represent a wide range of objects, which contributes to overgeneralization of the general classifier *ge* (个) in written Chinese [10]. The same mechanism also explains the overuse of indefinite classifiers such as *xie* (些).

3.3.2. The complexity of the Chinese classifier system

The Chinese classifier system is highly elaborates and sophisticated, with classifiers selected according to the shape, properties, and stylistic characteristics of the referent [6]. Because junior and senior secondary deaf students possess relatively limited Chinese vocabularies, they are often unable to fully master the collocational patterns between specific classifiers and their associated nouns or verbs. During second-language acquisition, learners therefore tend to adopt cognitive economy strategy by relying on the least marked and most broadly applicable classifier, *ge* (个), as a substitute for more specific classifiers [11, 12]. Even at the senior secondary level, many students have not fully acquired specific classifier collocations, allowing target-language overgeneralization to persist. Moreover, some learners overapply the rule that "every noun should be accompanied by a classifier", resulting in unnecessary classifier insertion. This cognitive bias is evident among students at both educational stages.

3.3.3. Insufficient linear language input caused by hearing impairment and weak semantic awareness of classifiers

Hearing children accumulate experience of noun-classifier collocations through continuous auditory exposure. Thus, they gradually developing an intuitive sense of classifier usage. Deaf students, however, lack sustained

spoken-language input and therefore rely primarily on fragmented classroom instruction to learn classifiers through written texts [9]. As a result, deaf students at both the junior and senior secondary levels have limited exposure to authentic linguistic contexts. Many of them fail to recognize that classifiers serve not only a quantitative function but also distinguish semantic categories and convey stylistic or affective nuances. Some of them may consider classifiers as meaningless additional grammatical elements that can be omitted without consequence. They also struggle to distinguish classifiers with subtle semantic differences, such as *fu* (幅), *chuan* (串), and *shuang* (双), and consequently replace them uniformly with the general classifier *ge* (个). These weaknesses in semantic awareness do not naturally disappear as students advance through higher grade levels.

3.3.4. Cognitive economy strategy

According to Interlanguage Theory, both beginning learners in junior secondary school and more advanced learners in senior secondary school tend to adopt cognitive economy strategy when confronted with complex classifier collocations [11]. When uncertain about the appropriate specific classifier, learners prefer to use the highly general classifier *ge* (个) to reduce memory demands, or simply omit the classifier in order to avoid potential grammatical errors. The inherent simplicity of sign language further reinforces this tendency toward economy. Consequently, both junior secondary students with limited linguistic foundations and senior secondary students with relatively restricted vocabularies rely heavily on *ge* (个), making classifier overgeneralization and omission the two most prevalent error types across both educational stages.

3.3.5. Classroom instruction

In both junior and senior secondary education, classroom instruction generally focuses on teaching the basic "numeral + classifier + noun" structure, while paying relatively little attention to the semantic, stylistic, and expressive distinctions among individual classifiers. Students are often expected to memorize classifier collocations mechanically rather than understand their usage in context [12]. As instruction emphasizes grammatical form over functional meaning and rarely differentiates the appropriate contexts for various classifiers, learners frequently resort to the general classifier *ge* (个), allowing incorrect substitute and overgeneralization errors to persist without targeted correction. In addition, insufficient contrastive instruction between sign language and Chinese further contributes to these errors. Special education teachers seldom provide systematic comparisons between numeral-classifier phrases in sign language and those in written Chinese. Neither do they explain particularly and explicitly to deaf students the negative influence of classifier omission in sign language on written Chinese production [10]. Consequently, deaf students continue to experience persistent first-language interference, leading to a wide range of classifier-related errors.

3.4. Comparison of classifier errors between the junior and senior secondary groups

The two groups exhibited a highly consistent ranking of the three most frequent classifier error types: omission > overgeneralization of the general classifier *ge* (个) and indefinite classifiers > incorrect substitute. Among the remaining three error categories, only incomplete classifier phrase occurred at a relatively higher rate in the junior secondary group (11.27%), whereas the other error types were comparatively infrequent and showed similar distributions across the two groups. This pattern is consistent with the core assumption of Interlanguage Theory, which holds that learners tend to fossilize high-frequency errors over time, thereby forming a relatively stable interlanguage system [13]. Consequently, although students advanced to higher grade levels, the fundamental difficulties involved in acquiring Chinese classifiers remained largely unchanged.

Several clear improvements, however, were observed as students progressed from junior to senior secondary school.

3.4.1. A marked reduction in incorrect substitute

Incorrect substitute accounted for 15.49% of the errors in the junior secondary group but declined to 9.43% in the senior secondary group. As learners received increased exposure to written Chinese, they gradually acquired conventional collocations between nouns and their appropriate classifiers. Consequently, overgeneralization of target-language rules became less prevalent, and the accuracy of selecting specific classifiers improved steadily.

3.4.2. A modest decline in incomplete classifier phrase

The proportion of incomplete classifier phrase decreased from 11.27% in the junior secondary group to 7.55% in the senior secondary group. This improvement suggests that students at higher grade levels produced more complete sentences and demonstrated a gradual improvement in syntactic competence, resulting in fewer errors of incomplete classifier phrase.

3.4.3. A substantial reduction in overgeneralization of the general classifier ge (个) and indefinite classifiers

The proportion of errors involving overgeneralization of the general classifier *ge* (个) and indefinite classifiers decreased from 23.94% in the junior secondary group to 18.87% in the senior secondary group, reflecting the developmental progression of classifier acquisition. According to Yanting Shi, lower-grade learners typically master only the basic grammatical function of classifiers and are unable to distinguish the semantic and stylistic nuances associated with different classifier categories. As a result, they rely almost exclusively on the highly general classifier *ge* (个) to replace more specific nominal classifiers. With increased vocabulary exposure and targeted instructional practice at higher grade levels, learners gradually acquire conventional collocations involving classifiers such as *tiao* (条), *zhang* (张), and *wei* (位), thereby reducing their reliance on generalized classifiers [14].

Overall, the interlanguage systems governing classifier use among deaf students in the junior and senior secondary groups demonstrate considerable continuity, with the ranking of error types remaining largely unchanged across two educational stages. As students progressed from junior to senior secondary school, the frequencies of incorrect substitute, incomplete classifier phrase, and overgeneralization of the general classifier *ge* (个) and indefinite classifiers all declined noticeably, indicating a gradual improvement in the acquisition of target-language classifier rules. However, classifier omission exhibited clear signs of fossilization, emerging as the most prominent error type at the senior secondary level. At the same time, the increasing use of verbal classifier phrases introduced greater structural complexity, resulting in more sophisticated word-order errors. Overall, deaf students' acquisition of quantifiers shows a progressive trend.

4. Pedagogical implication

In recent years, special education schools across China have begun integrating localized AI large language models and intelligent sign language technologies into Chinese language instruction for students with hearing impairments. These technologies have facilitated the development of a comprehensive digital teaching framework that spans lesson preparation, classroom interaction, and post-class reinforcement, thereby supporting the teaching of Chinese classifiers throughout the entire instructional process [15-17].

4.1. AI-assisted differentiated lesson preparation

During lesson preparation, teachers can utilize localized AI large language models to efficiently design differentiated instructional plans. By inputting students' classifier error data together with their educational stage, the system can rapidly generate complete lesson plans tailored to the needs of both junior and senior

secondary students. Such plans can emphasize numeral-classifier phrase practice for younger learners while focusing on the semantic distinctions among classifiers for more advanced students [15, 17]. In addition, sign language foundation models can be employed to generate instructional resources in batches, including classifier-specific signs, classifier handshape animations, and other visual materials. These resources can be organized into a bilingual reference database that aligns Chinese classifiers with their corresponding sign language expressions. By illustrating the natural omission of classifiers and the relatively generalized classifier handshapes in sign language, the database enables students to understand classifier omission and overgeneralization of *ge* (个) from the perspective of their first language [18, 19]. Furthermore, students' composition data can be uploaded to the AI system, which automatically categorizes classifier errors into six major types, including omission, substitution, incorrect word order and so on. This automated analysis substantially reduces the time teachers spend manually checking errors, allowing them to identify key instructional priorities in advance, prepare targeted correction activities, and improve the overall efficiency of lesson planning while reducing teachers' workload [15, 16].

4.2. Multimodal and visual interactive classroom instruction

During classroom instruction, multimodal AI technologies can be employed to deliver highly visual and interactive lessons on Chinese classifiers. AI-powered digital avatars capable of producing sign language demonstrations can simultaneously present sign language expressions alongside standard Chinese numeral-classifier phrases, helping deaf students overcome the habitual omission of classifiers that originates from sign language usage [18, 19]. Classroom activities may be organized into three progressive stages. At the first stage, AI-assisted image-matching games are used to review collocations among nouns, verbs, numerals, and classifiers. At the second stage, students complete online exercises, after which the AI system immediately evaluates their responses and provides corrective feedback accompanied by sign language explanations. At the third stage, AI-generated instructional videos are used to explain the semantic functions of classifiers and the distinctions among specific classifiers such as *tiao* (条), *zhang* (张), and *wei* (位). These activities directly address students' tendency to overuse the general classifier *ge* [15, 16]. Meanwhile, the instructional platform continuously monitors students' response accuracy at the class level. If classifier omission or overgeneralization errors become concentrated during classroom activities, teachers can immediately introduce targeted classifier discrimination exercises and dynamically adjust the instructional pace. Through rich visual representations, these multimodal resources help compensate for the lack of auditory language input experienced by students with hearing impairments [17, 19].

4.3. AI-based differentiated homework and long-term reinforcement

Following classroom instruction, AI systems can automatically assign differentiated classifier exercises and perform fully automated assessment. Based on each student's classroom performance, the system generates personalized learning tasks of varying difficulty. Foundational exercises emphasize classifier fill-in-the-blank activities to strengthen mastery of numeral-classifier phrases; intermediate tasks focus on correcting classifier-related sentence errors; and advanced exercises require students to compose short passages using appropriate classifiers, thereby reinforcing mastery of specific classifier collocations [15, 16]. After students submit written compositions, the AI system automatically detects all major classifier errors such as omission, addition, and overgeneralization, and generates a comprehensive class-level learning analytics report. The report identifies the most prevalent classifier errors at the current stage and provides data support to guide subsequent instructional adjustments and targeted teaching interventions [17, 19]. In addition, the system establishes an individualized classifier error portfolio for each student with hearing impairments. It

periodically delivers adaptive practice exercises featuring similar error patterns and provides supplementary review videos that compare Chinese classifiers with their corresponding sign language expressions. Through continuous review and repeated exposure, these personalized learning resources gradually reduce the fossilization of classifier omission caused by first-language transfer from sign language and promote the long-term development of accurate classifier use in written Chinese [16, 18].

5. Conclusion

This paper analyzed classifier errors in compositions of 20 prelingually deaf students from Grade 6 to Grade 12 with a self-built corpus of 66 articles. Six types of classifier errors were summarized, with a total error rate of 26.33%. Omission, overgeneralization of the general classifier *ge* (个) and indefinite classifiers, and incorrect substitute were the three most frequent errors for both junior and senior deaf students.

Comparative results show that senior students made fewer incorrect substitute, incomplete classifier phrase and overgeneralization errors after accumulating more Chinese input. However, omission became fossilized and dominated all mistakes made by senior deaf students. More complex verbal classifier structures also brought new word-order errors. This indicates that classifier errors still linger on even if deaf students have progressed from lower to higher grades.

Such errors arise from multiple factors. Negative transfer from sign language is the main cause, as sign language has no independent classifiers and induces omission and overuse of the general classifier *ge* (个). Besides, the complicated Chinese classifier system, insufficient hearing-based language input, learners' cognitive economy strategies and traditional classroom teaching only emphasizing mechanical memorization of classifier phrase structures jointly hinder deaf students' classifier acquisition.

To tackle these difficulties, an AI multimodal differentiated teaching plan covering lesson preparation, in-class interaction and after-school practice was put forward. AI tools can classify errors automatically, generate sign-language visual aids and assign personalized exercises to ease fossilized errors.

This study is limited by its single-school sample. Further research will expand corpora and verify the teaching effects of AI-assisted methods. In short, classifiers remain a tough bottleneck for deaf students' written Chinese. Targeted instruction as well as intelligent multimodal resources is essential for improving deaf students' writing ability to a standardized level.

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